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GAS ABSTRACTS

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1. GAS INDUSTRY

Domestic Industry

Baker, W. L. STRONG DOMESTIC INDUSTRY ESSENTIAL TO NATIONAL SECURITY. *World Oil* 127, 64-66, 69 (1947) *December.*

The author feels that conservation of natural resources such as petroleum by importation of foreign oils with a consequent reduction in the domestic industry would not be beneficial. It would lead to a technical deterioration of the domestic industry that would leave us unable to capitalize properly on the conserved resources in time of emergency. He states that the best protection is a strong industry, free of restrictions and free to keep pace technically with the country's needs.

H. R. Batchelder

"Dump" Sales

"DUMP" SALES NOT ESSENTIAL TO ECONOMICAL GAS OPERATIONS—F.P.C. *Oil Gas J.* 46, 57 (1947) *December* 6.

A staff report by the Federal Power Commission claims that interruptible sales at low cost are undesirable. The reduction in transmission costs per Mcf becomes relatively small at load factors above 60-70% and in many cases it is better to operate at this level off-peak than to sell additional gas at a very low price.

H. R. Batchelder

LP-Gas Supply

Lowe, W. F. FUEL SUPPLY. *Butane-Propane News* 1947, 107-108 (*December*).

An estimate and outline of expenditure of the LP-gas supply during the winter of 1948 is discussed.

E. F. Davis

2. APPLIANCES

Gas Appliances

Massey, H. APPLIANCE MEN WORK FOR REFORMS. *Butane-Propane News* 1947, 160, 162, 164 (*December*).

A discussion of the new plug-in gas connector now being developed by Savory Equipment Co. is given along with a brief outlook of future problems of the gas appliance manufacturers.

E. F. Davis

Gas Flame Impingement

American Gas Association Testing Laboratories. Research Bulletin Number 43. INVESTIGATION OF EXTENT OF GAS FLAME IMPINGEMENT ALLOWABLE FOR SATISFACTORY COMBUSTION. 1947.

The results reported in this bulletin show that the nature of the material heated and the

temperature it attains are the major factors for allowable flame impingement. The secondary factors are aeration, flame height and composition of gas.

E. F. Davis

Gas Floor Furnace

Eckles, J. D. INSTALLING THE GAS FLOOR FURNACE. *Gas Age* 100, 27-30, 78, 80, 84 (1947) *December* 11.

The author discusses the factors to be considered in selecting the size, location, venting, and positioning of controls for gas floor furnaces.

E. F. Davis

3. COMBUSTION AND INDUSTRIAL FURNACES

Furnace Atmospheres for Sintering

Webber, H. M. and Hotchkiss, A. G. FURNACE ATMOSPHERES FOR SINTERING, PART IV: GAS ANALYZERS. *Ind. Heating* 14, 1618, 1620, 1622, 1654, 1656 (1947) *October.*

The usual equipment available for rapid gas analysis for the control of furnace atmospheres consists of the Orsat and CO_2 indicators such as the Fyrite analyzer. Other instruments of special interest are the Ranerex furnace atmosphere analyzer which measures continuously the gravity of the gas and manual or automatic dew-point indicators. The Ranerex-balances a fixed volume of furnace gases against a fixed volume of air at similar conditions of temperature and humidity and draws approximately 20 cu. ft. of sample per hour. Dew-point indicators usually consist of a mirror cooled by a gas stream. The dew point is obtained by measuring by means of a thermocouple the temperature at which water begins to condense on the mirror.

C. Von Fredersdorff

Gas Turbine Power Plant

Yellott, J. I. THE GAS TURBINE POWER PLANT—VI. *Power Plant Eng.* 51, 113-114, 116, 118, 120, 122, 124 (1947) *September.*

This article is a continuation of the details of design of a gas turbine. Included in the discussion are gas turbine alloys and super alloys, temperatures of operation, thermal expansion, and principal problems such as oxidation and fatigue. The design of a coal burning gas turbine has been completed and the details of the coal supply system, coal supply control, coal burner, and ash separator are described and illustrated. The coal fired gas turbine locomotive is expected to become a reality in 1948, when the construction of a 3750 hp and a 4200 hp gas turbine will be complete.

C. Von Fredersdorff

Yellott, J. I. THE GAS-TURBINE POWER PLANT—VII. *Power Plant Eng.* 51, 124, 126, 128, 130, 132, 134 (1947) *November.*

The various existing gas turbine plants are analyzed from the viewpoint of their functions and are classified into: (1) Plants which supply hot or cold air for other prime movers, jet propulsion, or chemical processes, with little or no power to be developed. An example of this group is the turbo-supercharger. (2) Plants which supply air and generate some power, such as the Houdry unit. (3) Plants to generate power for land, marine and aircraft,

with no utilization of the kinetic energy of the exhaust. Examples of this group are seen in the G.E., Westinghouse, and Allis-Chalmers gas turbine units. (4) Plants which generate power and process heat.

C. Von Fredersdorff

Gas Turbine Power Plant

Yellott, J. I. and Lype, E. F. SOME EFFECTS OF PRESSURE LOSS ON THE OPEN-CYCLE GAS-TURBINE POWER PLANT. *Trans. Am. Soc. Mech. Engrs.* **69**, 903-911 (1947) *November.*

In the . . . gas turbine plant the pressure loss which occurs between the compressor and the turbine can seriously affect the performance of the cycle. This pressure loss will be particularly important when bituminous coal is used as the fuel, because of the necessity of interposing ash-removal equipment between the combustor and the turbine. The present study was undertaken in order to determine how much pressure loss can be tolerated in the ash eliminator, and how seriously the cycle efficiency would be affected by the presence of such equipment. The mathematical method outlined in the paper was chosen because a general solution was desired which would be applicable to higher values of turbine temperatures and regenerator effectiveness, when such values can be attained. The results are presented both in tabular form and in a series of graphs.

Excerpt from authors' abstract

Natural Gas for Locomotives

Poido, A. and Mironov, A. USE OF NATURAL GAS FOR LOCOMOTIVES. *Engrs. Digest* **4**, 529 (1947) *November.* From *Zheleznodorozhnii Transport,* No. 11/12, **1946**, 69-71.

The authors discuss the possibility of using gas for locomotives. Judging from the data given, the Russians are operating a Diesel locomotive on a mixture of 10-15% oil with 85-90% gas during the running period. Starting of the locomotive is accomplished in the usual manner in which the Diesel is started. Natural gas is carried in a tender stored in bottles at 700 to 1100 psig. A sketch is given showing the method of fuel injection.

E. F. Davis

4. CARBONIZATION AND GASIFICATION

Carbonizing Coal and Breeze

Roberts, J. CARBONIZING COAL AND BREEZE BLENDS. *Coke & Gas* (*British*) **9**, 337-340 (1947) *November.*

The author reviews the problems of blending coke breeze with coal to undergo carbonization. The effect of particle size of the blended breeze is discussed. Blending of weak and strongly coking coals together with coke breeze is suggested, the blending and carbonization to be done at a suitably centrally located carbonizing plant. The problem of sizing of carbonized blends is introduced.

G. M. Platz

Carburetted Water Gas Plant

Harrison, A. D. STEAM GENERATION AT 600 PSI 700 DEG. F. AS APPLIED TO CAR-

BURETTED WATER GAS PLANT. *Gas Age* 100, 14 (1947) *November* 27.

The author presents an analysis of the economics of generating new steam requirements at higher pressures and superheats, so that exhaust is suitable for use in existing equipment. This shows an attractive saving as applied at the Greenpoint plant of the Brooklyn Union Gas Company. Investment and operating costs and steam balances are given.

H. R. Batchelder

Coal Composition

Ward, S. G. COAL—CONSTITUTION AND UTILIZATION. *Gas Times* (*British*) 53, 233-234, 237 (1947) *November* 22.

In this article, the first of a series, the author explains the formation of various ranks of coal. Physical and chemical examination of coals and their behavior under thermal decomposition and vacuum distillation are given. The action of various solvents on coal, using the Soxhlet principle, is discussed.

G. M. Platz

Coal Preparation

Lessing, R. THE RATIONAL PREPARATION OF COAL. *Fuel* 26, 124-127 (1947) *September-October.*

In this article comments are given by staff members of the U. S. Bureau of Mines on the article "The Rational Preparation of Coal" published in *Fuel,* May-June of 1947. Generally the staff members of the Bureau of Mines concur in the proposals set forth by Lessing; however, there are differences of opinion with respect to the standards of preparation, the economics of the scheme as well as the ash content of the dusts of various coals.

G. M. Platz

Coal Structure

McCulloch, A. SOME RECENT CONCEPTIONS OF COAL STRUCTURE. *Can. Chem. Process Ind.* 13, 1012-1016 (1947) *November.*

The phases and structure changes which take place during coalification and carbonization of coal are discussed.

G. M. Platz

Coke Breeze as Fuel

Gilg, F. X. BURNING COKE BREEZE ON A CHAIN GRATE STOKER. *Blast Furnace Steel Plant* 35, 1252-1254, 1256, 1274 (1947) *October.*

Results of tests in a large Stirling boiler indicates properly sized coke breeze is an excellent fuel for steam generator when burned on a chain grate stoker in a furnace with a long rear arch. Details of operation and results of tests are given along with recommendations for increased operating efficiency.

G. M. Platz

Gas Oil Gasification

Miller, R. GAS OIL GASIFICATION IN HORIZONTAL RETORTS. *Gas World* (British) 127, 717-720 (1947) *November* 22.

This is an account of an attempt to use gas oil

in horizontal retorts to save coal and increase heating value of off-gas. The process was not economical, even with subsidized oil, and operating difficulties were numerous.

H. R. Batchelder

Gasification in Germany

Odell, W. W. GASIFICATION OF SOLID FUELS IN GERMANY BY THE LURGI, WINKLER, AND LEUNA SLAGGING-TYPE GAS-PRODUCER PROCESSES. *U. S. Bur. Mines Information Circular* 7415 (1947) *November*).

This bulletin summarizes data obtained by members of the British and American combined Intelligence Operation Survey during post-war inspection of the Lurgi generator installation at Bohlen, the Winkler plants at Leuna and Feitz, and the slagging-type gas producers at Leuna. The paper includes discussions of the principles of the processes and correlations with currently available thermal and equilibrium data on the processes. Very complete plant operation data sheets are included. The paper also gives a description of a plant at Leipzig for the manufacture of city gas and synthetic liquid fuels from water gas and coke oven gas by Fischer-Tropsch conversions.

S. Katz

Hydrogen Sulfide Removal

THE MANCHESTER LIQUID PURIFICATION PROCESS. *Coke & Gas* (*British*) 1947, 328-331 (*November*).

Hydrogen sulfide is removed from town gas by scrubbing with an alkaline suspension of ferric hydroxide, holding the solution long enough to permit formation of ferric sulfide, then air blowing to regenerate the hydroxide and liberate elemental sulfur. The crude sulfur is filtered off and dried. Operating costs are said to be comparable with those for dry-box purification; space and construction materials requirements are much less.

H. R. Batchelder

Liquid Slag

Marshak, V. L. INVESTIGATION OF THE COLLECTION OF LIQUID SLAG IN AN EXPERIMENTAL FURNACE. *Engrs. Digest* 4, 420-422 (1947) *September*. From *Izvestya Vsesoyuznogu Teplotechneskogo Instituta* 16, No. 3, 18-26 (1947).

An experimental furnace with an L-shaped combustion chamber showed that from 75 to 97% of the original ash in the coal fired could be removed in liquid form by impingement of the flame on the surface of a molten pool of slag at the bottom of the furnace. The separation of slag particles is attributed primarily to the centrifugal force caused by an abrupt change in direction of combustion products; and the degree of separation or ash removal efficiency is shown to be a function of the velocity of impingement of the flame on the surface of the slag pool, W_m, the distance between the outlet of the furnace and the surface of the slag pool, h, and the original concentration of ash. The data are correlated as slag collecting efficiency vs. the Froude number F where $F = W_m^2/gh$ the symbols of which are defined above (g = gravitational acceleration).

C. Von Fredersdorff

Organic Sulfur in Town Gas

King, J. G. GAS RESEARCH BOARD—FINAL REPORT ON A SURVEY OF THE

DISTRIBUTION OF ORGANIC SULPHUR COMPOUNDS IN TOWN GAS. *Gas World (British)* 127, 762-765 (1947) *November* 29.

This article forms a detailed abstract from the 51st Report of the Joint Research Committee of the Gas Research Board and the University of Leeds in which Dr. King presents the results obtained in a 3½ year survey of organic sulfur distribution conducted at 14 gasworks on 40 different gas streams. Included were tests on gases from horizontal retorts, coke ovens, intermittent vertical chambers, continuous vertical retorts (3 types: upward, downward and lambent heating), blue and carburetted water gas plants, Trefois producers, and ordinary gasworks producers. Seven different gas-making coals were examined. Gases of widely ranging calorific value—producer gas, straight coal gas, carburetted water gas, and the mixtures of these which form send-out gas—were tested. It was found that the organic sulfur content of a given gas often fluctuated greatly (from 15 to 50 grains) in short periods of time due to variations in the sulfur content of the coal being gasified. Total organic sulfur in horizontal retort gas averaged 30-35 grains before benzole extractions; and with the same coals, coke ovens produced gas containing about 20-25 grains total organic sulfur, intermittent vertical chambers 25-30 grains, continuous vertical retorts 30 grains, and carburetted water gas approximately 10-15 grains. The amount of thiophene formed appeared to be dependent upon the type of unit employed for making the gas, and it was found that oil scrubbing or active carbon treatment effectively reduced thiophene from 5-10 grains to 0.5 grain. Carbon disulfide formed 50-60% or more of the total sulfur present, and it was successfully eliminated by treating the gas catalytically. The presence of steam in gas making operations favored the formation of carbon oxysulfide which was also readily removed by catalytic treatment. In general, evidence showed that about one-third of the sulfur could be removed from gas by normal oil washing processes for benzole recovery or about two-thirds by the active carbon process when the carbon charge was fresh. Mercaptans occurred only in negligible quantities (0.1 grain or less) and therefore, were disregarded in sulfur removal considerations. It was concluded that, on the average, the gases produced from low sulfur coals for distribution in Britain contain 20-25 grains of sulfur per 100 cu. ft.; and this average could be substantially lowered by a wider application of oil scrubbing for benzole recovery.

H. Hakewill

Organic Sulfur Removal

Pettingell, W. EXTRACTION OF BENZOLE AND SULPHUR COMPOUNDS. *Natl. Gas Bull. (Australia)* 11, 18-20 (1947) *July-August.*

The author discusses the desirability of benzole recovery and organic sulfur removal from manufactured gas by means of oil washing. The chief effects that such treatment have on gas production and quality are considered under: (1) thermal equivalent of the crude benzole, (2) calorific value, (3) gas volume, and (4) specific gravity. In addition to the oil washing process, the advantages of the activated carbon process are also pointed out. For Australian conditions, it is concluded that the oil washing process is the more suitable. Additional details on the oil washing process are given along with operating data for the scrubbing towers, stripping stills, pumping units, heat exchangers, and benzole refining plant installed at the Australian Gas Light Company's Mortlake Station.

H. Hakewill

Solid-Fuel Research

Rose, H. J. TRENDS IN SOLID-FUEL RESEARCH. *Mech. Eng.* 69, 823-826 (1947) *October.*

General descriptions of research trends in both United States and Europe are given.

G. M. Platz

Storage

Bircher, J. R. STORAGE OF COKE OVEN GAS. *Gas* 23, 48-51 (1947) *December.*

See *Gas Abstracts* 3, 163 (1947) *October* for abstract.

Sulfur and Nitrogen in Coal

Horton, L. and Randall, R. B. THE OCCURRENCE OF SULFUR AND NITROGEN IN COAL. *Fuel* (British) 26, 124-127 (1947) *September-October.*

This paper is a brief review of the present knowledge of organic sulfur and nitrogen compounds in coal and an account of an investigation in progress which has as its object the more complete characterization of these compounds.

Excerpt from article
G. M. Platz—Reviewer

Synthesis Gas Production in Germany

PRODUCTION OF HYDROGEN-CARBON MONOXIDE SYNTHESIS GAS FROM COKE-OVEN GAS. *Coke & Gas* (British) 9, 346-349 (1947) *November.*

Various German developements in utilizing coke oven gas as a source of special products are described briefly. The Koppers methane-cracking process utilizes a hot refractory checkerbrick to crack coke oven gas in the presence of steam at 1200° C. as a source of synthesis gas. The Hibernia works recovered liquefied petroleum gas, ethylene and methane by a low temperature separation. The Klocknerwerke at Castrop-Rauxel produced hydrogen for ammonia synthesis. At Hochst 98.2% hydrogen was recovered.

C. H. Riesz

5. NATURAL GAS AND NATURAL GAS CONDENSATES

Centrifugal Compressor

Karassik, I. J. PROCESS ENGINEER'S GUIDE TO THE CENTRIFUGAL COMPRESSOR—I. *Chem. Eng.* 54, 110-114 (1947) *October.*

This is the first in a series on centrifugal compressors. The present installment gives terminology and basic information. Thus, it is stated that the centrifugal force developed depends only on the peripheral speed and fluid density while the head developed depends only on the peripheral speed. Acoustic velocity is considered to be a limiting factor since noise and wasted energy are to be eliminated.

J. D. Parent

Karassik, I. J. PROCESS ENGINEER'S GUIDE TO THE CENTRIFUGAL COMPRESSOR—II. *Chem. Eng.* 54, 132-135 (1947) *November.*

A series of charts is presented for the computation of head developed by centrifugal compressors used with ideal gases.

J. D. Parent

Compressor Station

A MODERN COMPRESSOR STATION. *Gas Age* 100, 13, 54, 56 (1947) *November* 27.

This is a brief presentation of certain features of Colorado Interstate Gas Company's new McClintock compressor station. It is 7050 ft. above sea level and houses four 800 HP Clark compressors which are derated 25% because of the high altitude. Since cooling water is scarce a fin fan unit was selected for jacket water cooling. Effective use is made of color in painting the engines, floors, walls, etc.

J. D. Parent

Condensate Production and Cycling

Jones, P. J. CONDENSATE PRODUCTION AND CYCLING. PART 11. PRODUCING AND INJECTION WELLHEAD PRESSURES. *World Oil* 127, 180, 182, 184 (1947) *December.*

Flow expressions are derived in terms of reservoir pressure, bottom hole and well-head pressures for given flow conditions. Drawdown (or build-up for the case of gas injection) is allowed for in the equations.

J. D. Parent

Dual Completions

Miller, E. B. Jr. A SURVEY OF DUAL COMPLETIONS. *World Oil* 127, 155-156, 158, 161 (1947) *December.*

See *Gas Abstracts* 3, 207 (1947) *December* for abstract.

Gas Lift and Repressuring

Weber, G. NEW GULF OIL PLANT IN WEST TEXAS COMBINES GAS LIFT AND REPRESSURING. *Oil Gas J.* 46, 96, 117 (1947) *December* 13.

Some details are given for a new plant for using sour gas for gas lift and pressure maintenance. Capacity is about 10 MMcf/day.

J. D. Parent

Gasoline Plant

Short, E. NEW GASOLINE PLANT. *Oil Gas J.* 46, 78-79, 98, 101, 103-104 (1947) *December* 13.

A detailed flow sheet together with some operating details are presented for Stanolind's new Hastings plant. Capacity is about 36 MMcf/day.

J. D. Parent

Leakage Detection

Portwood, H. D. DISCOVERY AND CONTROL OF LEAKAGE. *Am. Gas J.* 167, 27-29 (1947) *December.*

This is a short but clearly written article on detection of leaks. A sound program for checking equipment is suggested.

J. D. Parent

LP-Gas Peak Demand

Garretson, O. L. IS TANK SIZE THE

WHOLE ANSWER? *LP-Gas* 7, 30-31, 71-72 (1947) *November.*

Some suggestions are given for solving the problem of peak demand for LP-gas during the winter months.

E. F. Davis

LP-Gas Storage

Martin, J. W. PROPER INSTALLATION PRINCIPLES. *LP-Gas* 7, 21-22, 55, 57 (1947) *November.*

The factors to be considered for proper installation of LP-gas storage equipment on the customer's premises are discussed.

E. F. Davis

Propane Extraction

Boynton, W. W. MOST EASTERN REFINERS PUSHING PROPANE EXTRACTION. *LP-Gas* 7, 22, 63 (1947) *December.*

Production of propane in the East is rapidly growing but the demand can not yet be met. Attention in refineries is focussed on fuel oil and gasoline. There is ample opportunity to increase propane production greatly.

J. D. Parent

Transmission

Miller, B. GAS TRANSPORTATION SYSTEM CALCULATIONS—XVII. *Gas Age* **100**, 29-34 (1947) *November* 27.

In this article Mr. Miller describes in detail the manner of conducting the water column test for internal pressure testing of line pipe.

J. D. Parent

Miller, B. GAS TRANSPORTATION SYSTEM CALCULATIONS—XVIII. *Gas Age* **100**, 37-42 (1947) *December* 11.

This is a further treatment of inspection procedures. In this article the need for a purchaser to have his own inspector at the mill is stressed.

J. D. Parent

Use of Natural Gas

Cuthrell, H. H. WHAT NATURAL GAS CAN DO FOR THE MANUFACTURED GAS INDUSTRY. *Am. Gas. J.* **167**, 39-42 (1947) *November.*

See *Gas Abstracts* **3**, 209 (1947) *December* for abstract.

6. PETROLEUM AND SYNTHETIC LIQUID FUELS

Aviation Gasoline

Voorhies, A. Jr., Smith, W. M. and Hemminger, C. E. HYDROGENATION OF CATALYTICALLY CRACKED NAPHTHAS FOR PRO-

DUCTION OF AVIATION GASOLINES. *Ind. Eng. Chem.* 39, 1104-1107 (1947) *September.*

Hydrogenation of the olefinic constituents of catalytically cracked aviation gasolines to the corresponding paraffins without hydrogenation of aromatic constituents to naphthenes results in a gasoline of improved stability and lean-mixture octane number after addition of lead, with no sacrifice in rich-mixture rating. Commercial operation of the hydrogenation process for the improvement of fluid-catalyst-cracked aviation gasolines has been successfully carried out both at 150 and at 3000 pounds per square inch pressure using rugged sulfur-resistant catalysts of satisfactory activity and life.

Authors' abstract

Carbiding and Hydrocarbon Synthesis

Weller, S. KINETICS OF CARBIDING AND HYDROCARBON SYNTHESIS WITH COBALT FISCHER-TROPSCH CATALYSTS. *J. Am. Chem. Soc.* 69, 2432-2436 (1947) *October.*

The rates of carbiding, hydrocarbon synthesis and hydrogenation of carbide have been measured for a cobalt-thoria-kieselguhr catalyst (100:18:100 by weight) by means of a circulating gas system. The initial rate of carbiding is comparable with the synthesis rate but the steady rate of bulk carbiding is about one-tenth as great. Hydrogenation of carbide proceeded much faster than the carbiding of a reduced sample. Since the initial rate is comparable with the synthesis rate, it is possible that "surface carbiding" may be closely related to the synthesis. Bulk carbide formation is probably a secondary reaction. Apparent activation energies for bulk carbiding and for synthesis are 31 and 26 kcal./mole, respectively.

C. H. Riesz

Catalyst Regeneration

Snuggs, J. F. REGENERATION OF SPENT CATALYST IN FLUID CATALYTIC CRACKING. *Trans. Am. Soc. Mech. Eng.* 69, 785-788 (1947) *October.*

The factors influencing the design and operation of fluid catalyst regenerator are discussed. Spent catalyst containing 1 to 2% carbon by weight is fluidized in a stream of air (1.5 feet per second velocity) and is burned until the residual carbon in 0.3 to 1 weight percent. By means of catalyst recirculation, the regenerator temperature is maintained below 1200°F. maximum to prevent catalyst deterioration. The ratio of CO_2 to CO varies from 50:50 to 65:35, depending on the type of catalyst. Presence of metallic contaminants, such as iron, increase this ratio and result in increased air requirements. Up to 65-70% of the heat released may be recovered as steam.

C. H. Riesz

Catalysts for Hydroforming

Webb, G. M., Smith, M. A. and Ehrhardt, C. H. CHEMICAL AND PHYSICAL PROPERTIES OF ALUMINA-MOLYBDENUM OXIDE CATALYSTS FOR HYDROFORMING. *Petroleum Processing* 2, 834-836, 837-840, 842 (1947) *November.*

The preparation of alumina-molybdenum oxide catalysts for hydroforming was studied. Conventional catalysts, made by impregnating alumina with a molybdenum compound followed by drying and calcining, have low activities, high coke-forming properties and poor stability characteristics. Addition of small quantities of bentonite improved the thermal stability of the impregnated catalyst; Cr_2O_3 had little or no stabilizing effect. Precipitated catalyst was made by coprecipitating alumina and molybdenum hydroxides, followed by drying, calcining and pelleting. This catalyst was active, was low in coke forming and possessed greatly improved stability. Life tests showed that the precipitated catalyst produced a hydroformed gasoline of 87 octane number for 305 days. In a comparative test for the im-

pregnated type, the octane number dropped from 80.5 to 74.2 in 70 days. X-ray studies reveal that the crystallite size of the gamma-alumina was 5 to 10 times smaller for the precipitated type than for the impregnated type. Clusters of globules of molybdenum oxide were not found with the electron microscope although these may exist below 40 Angstrom units.

C. H. Riesz

Corrosion in Cracking Units

Camp, E. Q. EQUIPMENT PROTECTION FOR CRACKING UNITS. *Petroleum Refiner* **26**, 100-111 (1947) *December; Oil Gas J.* **46**, 68, 70-71, 73-74 (1947) *November* **22**; 83-87 (1947) *November* 29.

The author discusses the corrosion encountered and methods employed in its prevention in cracking reduced sour crudes and distillates. Corrosion experienced in operation of different cracking processes is discussed. The problems of corrosion are discussed and the methods used to lessen corrosion are discussed, but no mention is made of absolute prevention except those that have been tried and found to fail.

H. Dirksen

Fischer-Tropsch Catalysts

Hofer, L. J. E. and Peebles, W. C. X-RAY DIFFRACTION STUDIES OF THE ACTION OF CARBON MONOXIDE ON COBALT-THORIA-KIESELGUHR CATALYSTS. *J. Am. Chem. Soc.* **69**, 2497-2500 (1947) *October.*

Reduction of Fischer-Tropsch cobalt catalysts at 400°C. produced face-centered cubic (beta) form of cobalt which is converted only slowly to the hexagonal close-packed (alpha) form. However, carburetion of either alpha or beta cobalt, contained in the catalyst, resulted in the same carbide (CO_2) and subsequent reduction produced only alpha-cobalt. The cycle of carbiding and hydrogenating to produce methane can be repeated apparently indefinitely at 210°C.

C. H. Riesz

Fischer-Tropsch Synthesis

Craxford, S. R. THE CHEMISTRY OF THE FISCHER-TROPSCH SYNTHESIS. *Fuel* **26**, 119-123 (1947) *September-October.*

For the reaction of carbon monoxide and hydrogen to produce higher hydrocarbons, the best catalyst is cobalt : thoria : magnesia : kieselguhr prepared by precipitation in the proportions 100 : 5 : 8 : 200 by weight. The function of the kieselguhr is two-fold; (1) it assures a finely divided form of cobalt and (2) it maintains porosity of the catalyst granule. From surface area and x-ray diffraction patterns, it is concluded that there is a chemical combination of cobalt and kieselguhr, probably as a silicate. The formation of silicates is not fundamental, since active cobalt-magnesia catalysts have been prepared which prevent formation of a cobalt lattice during reduction and use. The second function of kieselguhr is to maintain access to the cobalt by the reacting gases; loss in activity is caused by the gradual accumulation of high melting wax deposits. The formation of methylene groups and subsequent polymerization is proposed as a reaction mechanism. The production of methane during synthesis can be suppressed by the addition of methane to the synthesis gas. In addition, the methane can interact with methylene groups to produce higher hydrocarbons. Thus, when a 50% methane, 50% synthesis gas mixture was used, about 10% of the methane was converted to higher hydrocarbons. The low formation of gases in the second stage of two-stage synthesis was

also found and offered as evidence of the existence of a polymerization-depolymerization equilibrium on the catalyst surface.

C. H. Riesz

Fluid Cat Cracker

Foster, A. L. SMALL FLUID CAT CRACKER HANDLES HIGH-SULFUR CHARGE EFFICIENTLY. *Oil Gas J.* **46**, 74-76, 111, 113 (1947) *December* 6.

A small (4327 bbl./day) fluid catalytic cracking unit has been placed in operation at the Casper, Wyoming, refinery of the Texas Company. Built by M. W. Kellogg Company, the unit has several new features which include: a separate spent-catalyst stripper, slurry settled integral with the fractionating tower, and balanced pressures between reactor and regenerator permitting location at the same level to reduce over-all height. A high sulfur crude (3-4%) is being charged.

C. H. Riesz

Fluidization

Murphree, E. V., Gohr, E. J., Kaulakis, A. F. THE FLUID SOLIDS TECHNIQUE: APPLICATION IN THE PETROLEUM INDUSTRY. *J. Inst. Petroleum (British)* **33**, 608-620 (1947) *October.*

A short review of the fluidization process is presented. This is followed by brief presentations of the more salient features of the fluid catalyst cracking process, the fluidized shale oil retorting process and the fluid hydrocarbon synthesis process.

J. D. Parent

Girbotol Unit

Norris, W. E. and Clegg, F. R. INVESTIGATION OF A GIRBOTOL UNIT CHARGING CRACKED REFINING GASES CONTAINING ORGANIC ACIDS. *Petroleum Refiner* **26**, 107-109 (1947) *November.*

This paper is a report on the work done to determine the cause and means for preventing the large consumption of diethanolamine in a H_2S gas purifying system of a thermal polymerization unit. The inactivating agents in the feed gas were identified as formic and acetic acids. A pre-wash in aqueous caustic, to neutralize formic acid, followed by a water wash were found to be effective in removing these acids, and the consumption of diethanolamine was decreased.

C. E. Hummel

Suspensoid Catalytic Cracking

Caesar, C. H. THE SUSPENSOID CATALYTIC CRACKING PROCESS. *Petroleum Refiner* **26**, 91-93 (1947) *October.*

Suspensoid catalytic cracking is conducted in standard thermal cracking coils by including 2 to 10 pounds of powdered catalyst per barrel of feed. In comparison with thermal cracking, an equal amount of gasoline can be produced of higher octane value. Plant operations have been conducted since 1940 at the Sarnia Refinery of Imperial Oil, Limited. Pilot plant data indicate that synthetic catalyst will produce gasoline of slightly higher octane number than will natural or activated clays from lube oil contacting.

C. H. Riesz

The following article, which has not been abstracted, is called to your attention:

Gordon, K. HYDROGENATION IN THE FUEL AND CHEMICAL INDUSTRIES. *Petroleum* **10**, 244-246, 262 (1947) *November-December.*

7. ANALYTICAL METHODS AND TESTS

Carbon Monoxide Determination

Berger, L. B. DETERMINATION OF CARBON MONOXIDE BY ABSORPTION IN THE HALDANE-TYPE GAS-ANALYSIS APPARATUS. *U. S. Bur. Mines Report of Investigations* **4187** (1947) *November.*

The author describes a method for determining small concentrations (0.2-0.5%) of carbon monoxide by absorption in a cuprous sulfate-beta naphthol-sulfuric acid reagent, known commercially as "cosorbent." The modifications necessary to adapt a Haldane gas analysis apparatus for this purpose are illustrated. Experiments with synthetic gaseous mixtures demonstrated an accuracy and precision of better than $\pm 0.05\%$ for CO in concentrations of 0.10% or more. Unsaturated hydrocarbons and hydrogen interfere with the results to the same extent that they are soluble in the reagent employed. A comparison of the analyses of several samples by this absorption method and two other methods yielded agreement within $\pm 0.05\%$ between the various methods used. The absorption method is quite rapid and only requires 20 ml. of sample.

H. Hakewill

Coal Sampling

SAMPLING COAL FOR ANALYZING PURPOSES. *Power Plant Eng.* **51**, 78-80 (1947) *November.*

A general discussion of the collection of gross samples of coal and their subsequent reduction to laboratory samples is given. The ASTM hand and mechanical methods for coal preparation are mentioned, and tables giving the minimum weight of sample required for coals of various particle size and containing varying amounts of impurities are included.

H. Hakewill

HCN Determination

Taylor, H. F. DETERMINATION OF HYDROCYANIC ACID IN CRUDE OR IN REFINED COAL GAS. *Gas J.* (*British*) **252**, 293-294 (1947) *November* 5.

This method for determining HCN in purified and crude coal gas is based on its absorption from the gas by passage through moist nickel carbonate and sodium carbonate deposited on paper pulp; the HCN thus absorbed as a cyanide is subsequently released by distillation with dilute H_2SO_4, or with dilute HNO_3 in the case of crude coal gas, and the HCN evolved is collected in caustic soda which is then titrated with silver nitrate. Complete details on the preparation of the nickel mixture used in the absorption step and directions for the procedures employed in performing HCN analyses under various conditions are given.

H. Hakewill

Infra-Red Absorption Analysis

Quarendon, R. INFRA-RED ABSORPTION ANALYSIS OF GASES AND VAPORS—6.

ADDITIONAL APPARATUS. *Petroleum (British)* **10**, 252-253 (1947) *November-December.*

The concluding article of this series is devoted to a description of methods of infrared absorption analysis which do not involve the use of dispersion methods. Several models of the Baird Associates analyzers are discussed with brief reference to some of their applications. A bibliography of twenty eight references is given.

S. Katz

Mass Spectrometer

Milsom, D. THE MASS SPECTROMETER AND CONTROL LABORATORY. *Petroleum Refiner* **26**, 83-88 (1947) *October.*

After pointing out some of the difficulties ordinarily encountered in the analysis of light hydrocarbon mixtures by chemical and physical methods, the author shows how well the mass spectrometer may be adapted to routine analyses of this sort. In order to give the analytical chemist a better understanding of the operation of the mass spectrometer, the general theory and scope of the instrument are briefly discussed. Then a number of analyses of synthetic samples are given to demonstrate the high degree of accuracy attainable, and another group of analyses on plant streams are given to demonstrate reproducibility. A comparison of analyses of plant samples by mass spectrometer and by low temperature distillation is also presented. Sampling procedure is briefly mentioned. It was concluded that, in general, the mass spectrometer substantially reduces the time required for routine control analysis; and yields accurate, reproducible results.

H. Hakewill

Particle-Size Analysis

Matheson, G. L. MODIFICATION IN ROLLER ANALYSIS FOR THE DETERMINATION OF PARTICLE-SIZE DISTRIBUTION. *Oil Gas J.* **46**, 307-308, 310 (1947) *November* 15.

By introducing elutriation air through a porous bronze plate instead of the usual jet, a modified aeration tube for use with the Roller apparatus largely eliminates grinding of particles during analysis by greatly reducing the velocity of the air stream acting on the sample under test. Comparative tests with the standard and modified aeration tubes employing new and regenerated catalysts demonstrate some decrease in grinding for most samples, and a large decrease in grinding for certain other types of samples, when the modified tube is used. It was found that particle-size distributions determined by means of the modified Roller apparatus agreed very well with sieve analyses; while results obtained with the standard Roller unit indicate grinding and do not agree with sieve tests. It was further shown that the efficiency of classification is dependent upon the relative humidity of the elutriation air used and that the ideal range is 50 to 70% relative humidity.

H. Hakewill

Particle Size Distribution

Jacobsen, A. E. and Sullivan, W. F. METHOD FOR PARTICLE SIZE DISTRIBUTION FOR THE ENTIRE SUBSIEVE RANGE. *Anal. Chem.* **19**, 855-860 (1947) *November.*

For the determination of sub-sieve particle size distribution in sedimentation procedures, the authors recommend the use of a buoyancy factor in the calculation of results. Certain modifications of the apparatus are also described and data tables and graphs are presented to show the reproducibility of results. The mathematical equivalence of the sedimentation and specific gravity methods is shown.

B. Grimm

Sulfur Determination

Dick, T. A. THE COLORIMETRIC DETERMINATION OF LESS THAN 0.001% SULPHUR AS CARBON DISULPHIDE IN BENZOLES. *J. Soc. Chem. Ind.* (British) **66**, 253-257 (1947) *August.*

The development of a sensitive colorimetric method for determining 0.0002 to 0.01% sulfur as CS_2 in pure benzole, or in colorless samples containing unsaturates, is described. After reviewing the various known color tests for CS_2, it was concluded that the method based upon the formation of copper diethylthiocarbamate from CS_2, diethylamine, and copper acetate appeared most reliable. An investigation of the effects of temperature, solvent, other sulfur compounds, and diethylamine, copper acetate, and CS_2 concentrations on the color thus produced was carried out. Color measurements were made in Nessler tubes utilizing a Lovibond tintometer for comparisons with standards. While the accuracy of the test is dependent upon the quantity of sample taken, it is claimed that a reproducibility of ± 0.000005 grams is possible.

H. Hakewill

X-Ray Spectrometer Analysis

Redmond, J. C. QUANTITATIVE ANALYSIS WITH THE X-RAY SPECTROMETER. *Anal. Chem.* **19**, 773-777 (1947) *October.*

The X-Ray spectrometer replaces the coventional film with a Geiger counter whose output is recorded directly on a strip chart recorder. Quantitative analysis of crystalline solid mixtures or compounds is greatly simplified, and where a characteristic reflection may be used to identify the "unknown" the actual determination may require only a few minutes. The paper discusses the importance of avoiding orientation of the sample and describes the procedure for recording the pattern, and preparing working curves. It is claimed that a deficiency of 0.16% carbon in WC can be detected.

S. Katz

8. GENERAL AND PHYSICAL CHEMISTRY

Properties of Liquids

Thomas, L. H. A RELATIONSHIP BETWEEN VISCOSITY, DENSITY, AND VAPOUR PRESSURE OF LIQUIDS. *J. Chem. Soc.* (*British*) **1947**, 822-829 (1947) *June.*

An equation has been proposed connecting the fluidity (f), density (d), and vapor pressure of a liquid. A comparison of $f\sqrt{d}$ at the same reduced pressure for 46 liquids shows it to be approximately constant for non-associated, non-symmetrical substances. A discussion of the theoretical significance of the constant is given.

S. Katz

9. ORGANIC CHEMISTRY

Catalyst Evaluation

Whitlock, M. H., Haddad, G. J. and Stahly,

E. E. SYSTEM FOR RAPID EVALUATION OF CATALYSTS FOR PRODUCTION OF BUTADIENE FROM ETHANOL. *Anal. Chem.* **19**, 767-770 (1947) *October.*

For the rapid evaluation of catalysts for the production of butadiene from ethanol, a multiple catalyst testing apparatus was devised that appraises 12 catalysts simultaneously. The components of each unit comprise a constant rate feeding buret, a Pyrex catalyst tube containing 20 cc. of catalyst, a scrubber and a gas collection bottle. Details of the electrically heated, aluminum block furnace are given.

C. H. Riesz

Catalyst Testing

Hinckley, J. A., Jr. and Sheppard, H. R., Jr. NEW METHOD FOR TESTING CATALYSTS. *Anal. Chem.* **19**, 771-773 (1947) *October.*

A catalyst testing unit is described for the reaction of ethyl alcohol with acetaldehyde to form butadiene. Features of the apparatus include a pressurized orifice liquid feeder, a scrubber and an evacuated gas collection tank.

C. H. Riesz

Chemicals from Natural Gas

Child, R. S. UTILIZATION OF NATURAL GAS IN THE CHEMICAL FIELD. *Public Utilities Fortnightly* **40**, 500-503 (1947) *October* 9.

Some $652,000,000 has been invested in southwestern hydrocarbon chemical plants between 1939 and 1945. While natural gas is an excellent raw material for chemical production, the actual market for natural gas as a source of chemicals is small. The most optimistic assumptions as to future expansion permit an estimate of less than 2% of present gas consumption.

C. H. Riesz

Chemicals from Petroleum and Natural Gas

Egloff, G. CHEMICALS FROM PETROLEUM AND NATURAL GAS. *Chem. Eng. News* **25**, 3634-3637 (1947) *December* 8.

See *Gas Abstracts* **3**, 172 (1947) *October* for abstract.

Dehydrogenation of Ethylbenzene

Ghosh, J. C., Rama Das Guha, S. and Roy, A. N. CATALYTIC DEHYDROGENATION OF ETHYLBENZENE (3). *Petroleum (British)* **10**, 235-236 (1947) *October.*

Through the use of apparatus described in previous parts of this article, the equilibrium between ethyl benzene and styrene plus hydrogen has been determined at temperatures of 360 to 495°C. and pressures ranging from 11 to 39 mm. of mercury.

C. H. Riesz

Infra-Red Spectra of Hydrocarbons

Avery, W. H. and Morrison, J. R. INFRARED SPECTRA OF HYDROCARBONS—II.

ANALYSIS OF OCTANE MIXTURES BY THE USE OF INFRA-RED SPECTRA OBTAINED AT LOW TEMPERATURES. *J. Applied Phys.* **18**, 960-967 (1947) *November.*

A procedure for obtaining infrared spectra of condensible hydrocarbons at low temperatures is described and the spectra of the four trimethylpentanes are given. Since band widths are roughly proportional to the square root of the absolute temperature, the low temperature technique minimizes overlap of bands and simplifies the analysis of mixtures. It is shown on probability grounds that reduction of the temperature from O°C. to —195°C. for a mixture of the 18 isomeric octanes increases the probable occurrence of at least one "non-overlapped" band for each of at least 17 of the isomers from 0.003 to 0.999. The use of infrared spectra at liquid hydrogen or liquid helium temperatures is suggested for the analysis of very complex systems.

S. Katz

10. CHEMICAL ENGINEERING

Absorption Plant

Kniel, L. and Slager, W. H. ETHYLENE PURIFICATION BY ABSORPTION. *Petroleum Processing* **2**, 769-772, 774 (1947) *October.*

See *Gas Abstracts* **3**, 151 (1947) *September* for abstract.

Agitator Systems

Mack, D. E. and Uhl, V. W. PERFORMANCE AND DESIGN OF AGITATORS. *Chem. Eng.* **54**, 119-121, 125 (1947) *September.*

Generalized correlations and design data obtained from the literature and experience on the performance and design of tank and agitator systems are given. The authors consider impeller type, diameter, speed and power requirements in the development of practical methods for predicting agitator performance and for designing agitator systems.

W. M. Dow

Mack, D. E. and Uhl, V. W. MASS AND HEAT TRANSFER IN AGITATOR SYSTEMS. *Chem. Eng.* **54**, 115-116 (1947) *October.*

This is the second of two articles dealing with the performance and design of agitator systems. The authors consider two types of mass transfer in agitator systems: (1) between solids and liquids, and (2) between immiscible liquids. They present existing correlations and show how systems can be designed by scaling-up from pilot plant data using these correlations. They also give experimental heat transfer correlations for an agitated fluid and a table of film coefficients for numerous fluids.

W. M. Dow

Distillation Nomographs

Nelsen, F. M., Brooks, F. R. and Zahn, V. NOMOGRAPHS FOR DISTILLATION OF LOW-BOILING HYDROCARBONS. *Anal. Chem.* **19**, 814-815 (1947) *October.*

Two nomographs are given to determine the

boiling points at 760 mm. mercury of liquefied gaseous hydrocarbons from the distillation pressure and temperature. The boiling point range is from 20 to —175°C. at 760 mm. pressure.

H. Dirksen

Heat Transfer Measurements

Mohun, W. A. and Peterson, W. S. PRECISION OF HEAT TRANSFER MEASUREMENTS WITH THERMOCOUPLES—GEOMETRIC ERRORS. *Can. Chem. Process Ind.* 32, 908-913 (1947) *October.*

This paper describes a method of embedding thermocouples in a tubewall in order to measure its surface temperature, and it analyses the errors involved in such a measurement. The authors point out that the relative error in the film coefficient, dh/h, is equal to (h x dy)/k, where y is the distance from the thermocouple junction to the tube surface, h is the heat transfer coefficient and k is the thermal conductivity of the wall. Consequently there is a real need for precision in locating the thermocouple junction when the film coefficient is high or the conductivity is low. The authors have developed a technique of precision installation of thermocouples in tube walls, and they describe the mechanical operations of installation and the physical measurement and mathematical treatment of the geometric errors. Their method embeds the thermocouple in a chordal hole in the tube wall, and consequently the wire is not brought out from the junction along an isothermal path. The effect of this error will be discussed in a later paper.

W. M. Dow

High Vacuum Calculations

Dryer, W. P. CALCULATIONS FOR HIGH VACUUM SYSTEMS. *Chem. Eng.* 54, 127-131 (1947) *November.*

This is the first of a set of articles on fluid flow in systems at extremely low pressure. The concepts of conductance and free molecular flow are presented.

J. D. Parent

Hydrocarbon Absorption

Edmister, W. C. HYROCARBON ABSORPTION AND FRACTIONATION PROCESS DESIGN METHODS. *Petroleum Engr.* 19, 55-58, 60, 62 (1947) *November.*

The "Sherwood approach" to solving absorption problems which had been explained in a previous installment is applied to specific problems and detailed solutions are offered.
Abstractor's Note: This should be read with interest by students and designers since Sherwood does not offer such detail in his text.

J. D. Parent

Pressure Drop Data

Leva, M. and Grummer, M. PRESSURE DROP THROUGH PACKED TUBES. PART III. PREDICTION OF VOIDS IN PACKED TUBES. *Chem. Eng. Progress "Trans. Section"* 43, 713-718 (1947) *December.*

A correlation of bed porosity in terms for relative size of particles to tube diameter for given methods of preparation of the beds is presented.

J. D. Parent

Ternary Distillation

White, R. R. and Boyd, W. T. STRIPPING AND RECTIFYING COLUMNS FOR TERNARY DISTILLATION. *Petroleum Processing* 2, 862-867 (1947) *November.*

Graphical methods are given and demonstrated as effective means for determining equilibrium plates in distillation columns involving ternary mixtures.

H. Dirksen

11. PROCESS EQUIPMENT AND INSTRUMENTATION

Automatic Control on Pipe-Line

Batchelder, C. D. and Rockwell, R. A. AUTOMATIC CONTROL ON THE PORTLAND-MONTREAL PIPE LINE. *World Oil* 127, 195-196, 198, 201, 202 (1947) *December; Pipe Line News* 1947, 4-10 (*November*).

See *Gas Abstracts* 3, 214 (1947) *December* for abstract.

Carbon Dioxide Determination

Clarke, F. E. DETERMINATION OF CARBON DIOXIDE IN WATER. *Anal. Chem.* 19, 889-891 (1947) *November.*

An improved method and apparatus are described for the quantitative determination of carbon dioxide in industrial waters. A circulating pump and a rubber expansion bladder permit working in a completely closed system. Evolved carbon dioxide is absorbed in barium hydroxide solution, and the residual barium hydroxide is titrated with hydrochloric acid to the phenolphthalein end point. Excellent results are obtained with a maximum deviation from the mean of 0.5 ppm. The apparatus devised is durable and individual determinations require about 15 minutes.

C. E. Hummel

Cyclone Dust Separator

Feifel, E. THE CYCLONE DUST SEPARATOR. *Engrs. Digest* 4, 527-529 (1947) *November.* From *Maschinenblaw und Wärmewirtschaft* 1, No. 1/2, *July-August* 1946, p. 36-41.

A novel design for small cyclones used by I. G. Farbenindustrie is described. An attempt is made to overcome the tendency of the air stream to pick up solids which have been thrown out of suspension.

J. D. Parent

Dry Gas Meter

Armitage, S. THE DEVELOPMENT OF THE DRY GAS METER. *Gas World* (*British*) 127, 728-730 (1947) *November* 22.

Since the gas industry is vitally dependent for the whole of its revenue upon the sale of gas measured by gas meters, these meters must be able to accurately measure and record the amount of gas passed for a considerable period of time without attention. There are two general types of meters; positive and inferential. The Sale of Gas Act states that only the posi-

tive type may be used when gas is sold to the consumer. The bulk of consumer meters are dry positive meters; so, only this type of meter is discussed. Comparative merits of the open type and enclosed valve meters are given. The author believes that the open top meter will eventually be the only standard on the market because it performs efficiently all the functions required of a gas meter. Mention is made of tests being made using graphite valves. These valves cut friction to a minimum, are self-lubricating, and discourage gas depositions. No advantage is gained by oil lubrication of valves in modern meters; on the old type meter it may avoid non-registration and noise but requires periodic visits to each meter and such periods vary.

E. Strong

Dust Determination

Patrick, E. A. K. AN ELECTROSTATIC METHOD FOR DETERMINING DUST IN WET GASES. *J. Soc. Chem. Ind.* (*British*) **66**, 249-253 (1947) *August.*

A description of a small electrostatic precipitator which enables the determination of the dust content of gases, including those which are flammable and often contain considerable quantities of water vapor, having a dew-point as high as 60°C. Better than 75% of the dust precipitated had a particle size of less than one micron. The gas was passed through three Pyrex tubes eight inches long and one inch in diameter, and the dust deposited on a nichrome wire extending down the center of each tube. The apparatus can be used at room temperatures or at temperatures above the high dew-point by surrounding the tubes with a heated air jacket. The tubes, electrical equipment, and technique developed to avoid igniting the gas or precipitating dust in wet lines are described. Results of runs on producer gas are given with both "hot" and "cold" methods.

R. D. Clevenger

Flow Meter

Young, E. T. and Patterson, O. L. FLOW METER FOR MEASURING INPUT TO WATER-INJECTION WELLS. *Oil Gas J.* **46**, 60-61, 75 (1947) *November* 1.

The Sun Oil Company has developed a new type of flow meter for measuring the flow of water to input wells wherein the water is injected by gravity from the water bearing sand through perforations in the well casing at the same level. The water passes through the meter in which a portion of the energy developed by the moving liquid is used to compress a spring through a 1000 to 1 gear reduction from a turbine wheel. A stepped cam periodically releases this spring which drives a hammer against an anvil which is tightly fastened to the sucker rod from which the whole meter assembly is suspended. The hammer below sends an acoustic signal up the rod to the surface where the sound can be picked up by ear or by an electric counter. An orifice choke below the meter mechanism is used to regulate the flow. Calibration of the meter for injection rate of water in terms of hammer counts can be made at the surface. It is claimed that this type of meter is inexpensive, is capable of operating for many months without attention, and provides accurate flow data over a wide range of flow rates.

E. Strong

Heat Pump

Oglesby, S. Jr. and Kemler, E. N. POSSIBILITIES OF ENERGY STORAGE IN HEAT PUMP APPLICATIONS. *Heating & Ventilating* 44, 69-73 (1947) *November.*

Several heat pump installations which utilize heat storage to meet short periods of maximum heating demand are discussed. Of the number of possible methods of adapting the heat pump

to a heat storage tank for heating, the following two systems are the most promising: 1. The heat pump may operate continuously, charging the tank during the night. The normal heat output may then be supplemented by the storage tank when required. 2. Supplementary electrical heat may be supplied by a storage tank which is charged by direct heaters. Advantages of the installations are reduction in size of unit and a distribution of the load. Disadvantages of the systems are added space and cost of storage tank.

J. J. First

High Vacuum Applications

Whitehurst, B. W. HIGH VACUUM AND ITS PROCESS APPLICATIONS. *Chem. Eng.* 54, 98-102 (1947) *October.*

This article discusses the construction and operation of mechanical pumps and diffusion pumps for low vacuum work. Considerable mechanical details are given. Some applications are mentioned.

J. D. Parent

Measuring Distribution of Gas Flow

Morgan, F., Reed, D. W. and Gray, L. L. METER FOR MEASURING DISTRIBUTION OF GAS FLOW IN WELL BASES. *Petroleum Technol.* 10, TP-2276 (1947) *November.*

The Gulf Research and Development Company have developed a subsurface meter for measuring the flow of fluids at different levels in a well base. The fluid flows through the meter and over a semi-conductive flow sensitive element having a high temperature coefficient of resistance and a high specific resistance and which is heated by an electric current to a temperature higher than the ambient temperature. An increase in the flow of fluid increases the rate of heat dissipation and the temperature of the element decreases. Such temperature decreases are accompanied by an increase in resistance because of the negative temperature characteristics of the element; these increases in resistance are measured. In practice the rate of flow is measured and recorded in terms of voltage drop across the element. The authors claim that the instrument is more sensitive than any other previously reported for performing similar functions and that it has been used to study the injection capacity of different horizons in gas injection wells in Alabama.

E. Strong

Moisture Analysis

Finnegan, T. J. and Smith, H. L. DETERMINATION OF MOISTURE CONTENT OF COAL BY MEANS OF PULVERIZER HEAT BALANCE. *Trans. Am. Soc. Mech. Eng.* 69, 635-642 (1947) *August.*

In view of the fact that all pulverized-coal-fired plant performance calculations based on the "as fired" heating value of the coal require an accurate average moisture analysis of the coal which is difficult to obtain generally, a method of calculating the average moisture content of the coal from the temperature of the primary air to the pulverizer is derived. The method is based on a heat balance over the pulverizer, taking into account the unvaporized portion of the water in the coal after leaving the pulverizer, radiation losses from the pulverizer, heat in the primary air and coal charge, and work of pulverization. The results are given in graphical form, from which moisture contents can be read directly, knowing the rate of air and coal throughout and the temperature of the primary air to the pulverizer. A discussion of the accuracy of the method is included.

C. Von Fredersdorff

Oxygen Measurement

Cohn, G. INSTRUMENT FOR CONTINUOUS MEASUREMENT AND RECORDING OF LOW CONCENTRATIONS OF OXYGEN IN GASES. *Anal. Chem.* 19, 832-835 (1947) *November.*

An instrument is described for the continuous determination of traces of oxygen (or hydrogen) in gases. Its operation depends upon the measurement of the heat of reaction between oxygen and hydrogen over a cold catalyst. The calibration of the instrument can be maintained despite fluctuations of the activity of the catalyst. A concentration of 0.001% oxygen in hydrogen can be measured with an accuracy of about —15%. For concentration ranges of 0 to 0.1% or 0 to 0.2% of oxygen, the absolute error is about 2% of the range value. The lowest detectable oxygen concentration with the instrument is 0.0002%. Carbon monoxide, unsaturated hydrocarbons, and certain organic vapors interfere with the accuracy of the oxygen determination. This instrument may be used either as an indicator or recording controller.

M. Nolt

Vapor Pressure Controller

Gallagher, G. G. CONTROL OF NARROW-BOILING-RANGE FRACTIONATING COLUMNS. *Instruments* 20, 1004-1005 (1947) *November.*

A vapor-pressure controller (essentially a composition controller) is used for regulating narrow-boiling-range columns. This instrument makes the necessary adjustments to the process for variations in column temperature, pressure, feed composition or feed quantity, and controls the composition within extremely close limits. Diagrams are presented.

M. C. Miyaji

12. MATERIALS OF CONSTRUCTION

Cathodic Corrosion Protection

CATHODIC CORROSION PROTECTION. *Steel* 121, 106, 124 (1947) *November* 10.

Magnesium rods are used as a cathodic protector in many installations where metal is in contact with water. Its advantages over that of actually installing an external source of power supply as well as a brief description of a new improved method of installing magnesium as an underground pipe protector are given in this article.

S. Mori

Cathodic Protection

Mears, R. B. MECHANISM OF CATHODIC PROTECTION. *Oil Gas J.* 46, 77, 79-80, 82 (1947) *December* 6; *Gas* 23, 42-45 (1947) *December.*

The mechanism of cathodic protection together with some basic fundamentals involving galvanic type corrosion is presented. A discussion of different methods of determining the minimum externally applied current density in cathodic protection is also given. None of these methods seems adequate for all cases of corrosion in buried pipelines.

S. Mori

Corrosion Inhibitor

Breston, J. N. and Barton, K. FIELD TEST OF CORROSION INHIBITOR FOR LOW pH FLOOD WATER. *Oil Gas J.* 46, 91-92, 95-96 (1947) *December* 6.

In the production of oil by the high pressure water flooding method, corrosion inhibitors raising the pH of the water were found undesirable. This article mentions three amine types of corrosion inhibitors which will keep the pH low. A detailed description of testing their effectiveness using coupons is given.

S. Mori

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